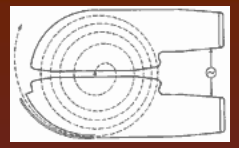
Introduction to Safety Systems in Research Accelerators

Lifecycle Costs

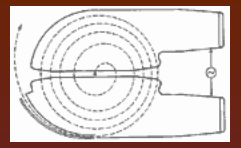
USPAS

June, 2004



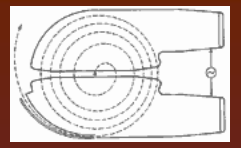
Cost Benefit

- Method for making risk based decisions
- Senior management assumes risk of consequences whether they know it or not



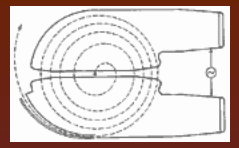
Costs/Benefits

- Measure of "value"
- For accelerators this may not be monetary
  - Cost in Contract Metrics
    - DART
    - TRC
    - Type (n) investigation
  - Cost can be expressed in operating hours (Availability)
    - Machine hours
    - Experiment hours



Human Cost

- Driven by most senior management
- Driven by ALARP
- Regulatory requirements
- Tolerable Risk
- Perceived Risk includes ethical judgments



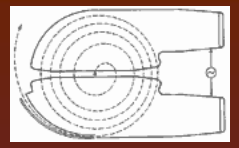
Loss Continuous Functions

$$Cost\ of\ \ failures = \left[\left(C_r + C_{lp} \right) \times (1 - A) \right]$$

C_r – Repair Costs

C_{lp} – cost of lost Production

A – Availability



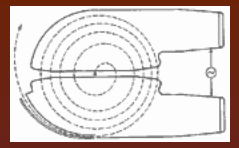
Loss for Event-based Functions

$$Cost\ of\ \ failures = \left[C_E \times P(E)\right]$$

C_r – Repair Costs

C_{lp} – cost of lost Production

A – Availability



Operating Costs

$$OperatingCosts = \left[\left(C_{Change} + C_{MAINT} + C_{Consumables} + C_{Failure} \right) \times Lifetime \right]$$